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ZEHNERIA SUBGENUS ZEHNERIA (CUCURBITACEAE) IN JAVA AND BALI

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SUMMARY

Three species of *Zehneria* subg. *Zehneria* are accepted for Java and Bali: *Z. mucronata* (Blume) Miq., *Z. perpusilla* (Blume) Bole & Almeida, and *Z. repanda* (Blume) C. Simmons, comb. nov. They are defined, keyed out, and lectotypified.

Key words: Cucurbitaceae, *Zehneria*, Java, SE Asia.

INTRODUCTION

The correct naming of specimens of *Zehneria* Endl. (1833) from Java, where comparatively a large amount of material from a wide range of habitats has been collected, has remained problematic, even after the publication in the Flora of Java by Backer (1963). Species of small-flowered cucurbits, including those now to be referred to as *Zehneria*, were formerly described under various generic names, but in the monographic treatment of the family by Cogniaux (1881, 1916) were placed in his broadly-conceived genus *Melothria* L. Jeffrey (1962) redefined the genus *Melothria* so as to be restricted to the New World (distinguishable by male flowers with two stamens 2-thecous and one stamen 1-thecous), re-establishing *Mukia*, *Solena*, and *Zehneria* as Old World genera. *Zehneria* is characterized by male flowers with the three stamens all 2-thecous, the thecae ± erect, straight or little curved. Within the Malesian area *Zehneria* can be divided into two subgenera. In subgenus *Pseudokedrostis* (Harms) C. Jeffrey the stamens are inserted towards the throat or on the upper half of the receptacle-tube, filaments short (anthers subsessile), thecae straight, with the connective conspicuously produced, and the female flowers and fruit have a long and slender pedicel. In subgenus *Zehneria* the filaments are comparatively longer, inserted towards the base of the hypanthium, thecae ± curved, connective not or only slightly produced, and in Malesia the female flowers and fruits are comparatively short-pedicelled and the whole plant usually dries dark brown. In the present study a revised solution for the taxonomy of the very diverse-looking Java material of this latter subgenus is given.

For Java, Backer (1963) accepted three species which actually belong in *Zehneria* subg. *Zehneria*, under *Melothria*, viz. *M. cordata* (Thunb.) Cogn., *M. mucronata* (Blume) Cogn., and *M. perpusilla* (Blume) Cogn. Blume (1823, 1826) published for Java four binomials referable to subgenus *Zehneria*, under the generic name *Bryonia*,

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and Miquel (1855) added one more, *Zehneria exasperata*. The Blume names – *Bryonia mucronata*, *B. perpusilla*, *B. repanda*, and *B. scabrata* (of which three are retained in the present study) – are the oldest ones available for the whole SE Asian region and they obviously cover most of the diversity present in the subgenus in the whole of Malesia. Other old names of widespread closely related species which might possibly occur in Java and were formerly actually used to name specimens from Java in the herbarium, have heen taken into account, particularly the older African name *Zehneria scabra* (L.f.) Sond., of which *Melothria punctata* (Thunb.) Cogn. and *M. cordata* (Thunb.) Cogn. are synonyms. Old but later relevant Indian names are *Zehneria hookeriana* Arn. and *Z. maysorensis* (Wight & Arn.) Arn.; see Wight & Arnott (1834), Arnott (1841), Wight (1844, 1850), Clarke (1879), Chakravarty (1959), and Keraudren-Aymonin (1975). With the present study for Java three very similar and apparently closely related species have been accepted: *Zehneria mucronata*, *Z. perpusilla*, and *Z. repanda*. This confirms the ideas of Jeffrey (1980), who, however, considered *Z. perpusilla* as interpreted by him as rather a montane, Asian subspecies of the widespread *Z. scabra*, a species which is widely distributed in Africa. It also agrees with Backer (1963), but as compared with his treatment, our present species are defined differently, one name has been changed, and all epithets are now combined in *Zehneria*. Two of the three accepted species apparently have a wider distribution, outside Java and Bali. As remarked before, the differences between the species are small, and the characters may somewhat intergrade, and could fall into one widely-circumscribed species, *Z. scabra* (L.f.) Sond., as treated by Jeffrey (1962: 369; 1967: 123). However, this latter species, which in Africa is morphologically very variable, can possibly be kept apart, although on minor characters, e.g. the filaments inserted somewhat higher up on the hypanthium-tube, or the fruit turning red at maturity. Whether this holds true, and whether more differences exist, needs further investigation. Meanwhile, it is hoped that the outcome here presented, with the acceptance and definition of three species for Java, will serve as a stable element to be used in the future naming of the confusingly variable material of *Zehneria* subg. *Zehneria* for the whole Malesian area. The majority of the original material used by Blume is at L, and the four names published by him in 1826 have been lectotypified in accordance with their protologues and annotations in Blume's handwriting on the labels of the specimens at L. It should be noted that the lectotypification turned out to be partly at variance with the implicit interpretation of the names by earlier authors.

CHARACTERS

The following characters have been checked particularly in the taxonomy of the species of *Zehneria* subg. *Zehneria* in Java. The general shape (or outline) of the leaves soon appeared to be extremely variable in all three species, and has been discarded as a character of practical use.

1. Altitude of occurrence — This is generally a good indicator of the species, *Z. mucronata* being a lowland species while *Z. repanda* is montane.
2. Plant monoecious or dioecious — It appears that generally specimens are dioecious, irrespective of their age or state of development. All material of *Z. perpusilla*, however, is monoecious.

3. Indumentum of leaves, hairy, scabrous, or glabrous (beneath) — Very variable, but *Z. repanda* usually is more scabrous on the leaves and more coarsely hairy.
4. Inflorescence type — Whether the always pedunculate male racemes have single or ± compound flower fascicles, or whether the female racemes are subsessile or pedunculate and few- or several-flowered, did not provide useful differences for species delimitation.
5. Size of perianth — In *Z. mucronata* the male hypanthium-tube is proportionally longer and narrower than in *Z. repanda.*
6. Pilosity of hypanthium-tube and petals inside, petals outside, and filaments and staminodes — Very variable, but with certain evident differences according to the species.
7. Place of insertion of the stamens, staminodes — In the Java material this is usually at the very base of the hypanthium-tube, beside the disc, but is occasionally slightly higher up, though never above the apex of the disc.
8. Shape of the anther — Either somewhat elongated or circular in outline, according to the species.
9. Shape of ovary and length of 'neck' to the perianth — Both are important characters for species delimitation.
10. Shape and size of fruit — Either globose or ellipsoid(-oblong), decisive in species delimitation.
11. Distinctness of the pitting of the pericarp — The pitting is always present, and seems less distinct in the globose-fruited *Z. perpusilla* and *Z. repanda.*
12. Size and margin of seed — This differs somewhat according to the species; *Z. repanda* has the smallest seeds, with margin faint or absent.

KEY TO THE SPECIES OF ZEHNERIA SUBGENUS ZEHNERIA IN JAVA

1a. Outline of anthers ± elongated; filaments pilose throughout or at least in the lower half. Staminodes largely pilose. Ovary and fruit elliptic or oblong; neck between ovary and perianth conspicuous or inconspicuous, less than half as long as the ovary. Seeds margined . . . . **1. Z. mucronata**
b. Outline of anthers ± circular; filaments glabrous or partly pilose. Staminodes glabrous or partly pilose. Ovary and fruit (sub)globose; neck conspicuous, at least half as long as the ovary. Seeds narrowly margined or unmargined 2
2a. Lower leaf surface (almost) glabrous. Filaments pilose in the lower half; staminodes partly pilose. Seeds narrowly margined . . . . **2. Z. perpusilla**
b. Lower leaf surface, at least the veins, bristly hairy (sometimes glabrous). Filaments glabrous or pilose in the middle only; staminodes (largely) glabrous. Seeds unmargined or hardly margined . . . . **3. Z. repanda**

1. Zehneria mucronata (Blume) Miq. — Fig. 1

Zehneria mucronata (Blume) Miq., Fl. Ind. Bat. 1, 1 (1855) 656; Jeffrey, Kew Bull. 15 (1962) 371; The Cucurbitaceae of Eastern Asia, Royal Botanic Gardens, Kew (1980) 16. — *Bryonia mucronata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923 (incl. var.); Ser. in DC., Prodr. 3 (1828) 304 (incl. *β denticulata*). — *Melothria mucronata* (Blume) Cogn. in A. & C. DC., Monogr. Phan. 3

(1881) 608; in Engl., Pflanzenr. IV.275.I (1916) 108; Backer in Backer & Bakh.f., Fl. Java 1 (1963) 297. — Lectotype (designated here): *Blume s.n.* ('Pariagengie'), Herb. Lugd.-Bat. 901.288-251 [Kew Negatives 4858, 4859], Java (L).

Usually dioecious. *Leaf* blades ovate, rarely faintly lobed, scabrous with whitish cystoliths above, lower surface glabrous or variously soft-hairy; margin subentire or coarsely dentate. *Tendrils* glabrous. *Male perianth* at anthesis (3–)4–5 mm diam.; hypanthium-tube c. 2 mm wide. *Petals* adaxially and hypanthium-tube inside pilose. *Anthers* slightly elongated; filaments pilose completely or at least in the lower half. Staminodes of female flowers pilose. *Ovary* elliptic to oblong. Neck between ovary and perianth almost absent or distinct, but comparatively short, shorter than half of the length of the ovary. *Fruits* subglobose-elliptic or oblong, 10–15 mm long, usually distinctly pitted, greenish or brown-red. *Seeds* 4–5 mm long, margined.

Distribution — Whole of Java, and Bali.

Habitat & Ecology — In lowland and in the mountains; up to 1600(–2000) m alt.

Notes — A very variable species, both in flower and vegetative characters. Specimens from East Java tend to have slightly larger fruits as compared to those from West Java; on Bali, however, smaller fruits like in West Java are found.

Most specimens are of one sex, apparently irrespective of the age (developmental stage) of the plants. Only occasionally a stray male flower can be found in female plants.

2. Zehneria perpusilla (Blume) Bole & Almeida

Zehneria perpusilla (Blume) Bole & Almeida, J. Bombay Nat. Hist. Soc. 79, 2 (1983) 315 (for the type only).

[*Cucumis perpusillus* Noroña, Verh. Bat. Gen. 5 (1791, ed. 2, 1827) 73, 'Hamprù-bogò', nom. nud.]

[*Momordica rotunda* Noroña, Verh. Bat. Gen. 5 (1791, ed. 2, 1827) 80, 'Corrèc-cotòc', nom. nud.]

Cucurbita perpusilla Blume, Cat. Buitenzorg (1823) 105. — *Bryonia perpusilla* (Blume) Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 926; Miq., Fl. Ind. Bat. 1, 1 (1855) 660. — *Bryonia stipulacea* Willd. *β perpusilla* (Blume) Ser. in DC., Prodr. 3 (1828) 307. — *Melothria perpusilla* (Blume) Cogn. in A. & C. DC., Monogr. Phan. 3 (1881) 607; in Engl., Pflanzenr. IV.275.I (1916) 106; Backer in Backer & Bakh.f., Fl. Java 1 (1963) 297, p.p. — *Zehneria scabra* auct. non (L.f.) Sond.: C. Jeffrey, Kew Bull. 15 (1962) 369, 370, p.p., for the syn. *Melothria perpusilla* (Blume) Cogn. only. — Lectotype (designated here): *Blume s.n.* ('Hampru Bogor', 'Korres Koda'), Herb. Lugd.-Bat. 901.288-275, [Kew Negative 4853], Java (L).

Cucurbita scabra Blume [non *Bryonia scabra* L.f., 1781], Cat. Buitenzorg (1823) 105. — *Bryonia scabrata* Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923; Ser. in DC., Prodr. 3 (1828) 304; Miq., Fl. Ind. Bat. 1, 1 (1855) 659. — Lectotype (designated here): *Blume s.n.* ('Aroy Korreg Kottok'), Herb. Lugd.-Bat. 901.288-297, [Kew Negative 4856], Java (L).

Monoecious. *Leaf* blades ± ovate, entire or 3(–5)-lobed to about half-way, scabrous with whitish cystoliths above, lower surface (almost) glabrous; margin ± irregularly finely or coarsely remotely dentate. *Tendrils* glabrous. *Male perianth* at anthesis c. 3 mm diam.; hypanthium-tube c. 1.5 mm wide. *Petals* adaxially and hypanthium-tube inside pilose. *Anthers* circular in outline, filaments pilose in the lower half. Staminodes of female flowers pilose in the upper half. *Ovary* globose. Neck between ovary and perianth conspicuous, at least half as long as the ovary. *Fruits* globose, 6–8 mm diam., faintly finely pitted (lens!), greenish. *Seeds* c. 3.5 mm long, narrowly margined.

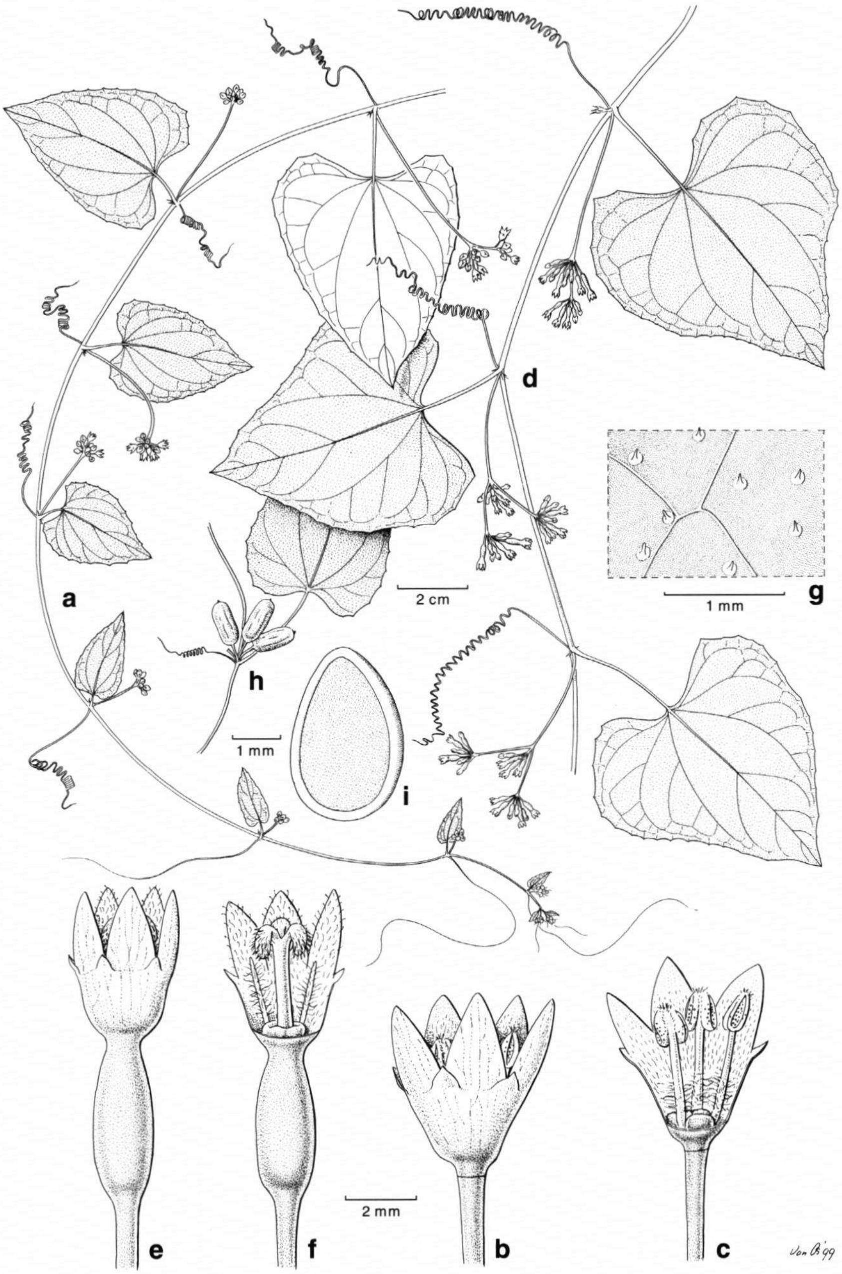


Fig. 1. *Zehneria mucronata* (Blume) Miq. a. Shoot with male inflorescences; b. male flower; c. ditto, perianth partly removed to show stamens and disc; d. shoot with female inflorescences; e. female flower; f. ditto, perianth opened to show style and stigmas, disc, and staminodes; g. portion of upper leaf surface, with cystoliths; h. node with sessile infructescence; i. margined seed. [a–c: *De Wilde & De Wilde-Duyfjes 21727*; d–g: *De Wilde & De Wilde-Duyfjes 21728*; h & i: *Backer 36679*; all L].

Distribution — W Java, Mt Salak.

Habitat & Ecology — In shady places; altitude not indicated, but presumably in lower montane area.

Notes — 1. Known only from the type-collections (with several duplicates) and a somewhat doubtful collection by Reinwardt, all before the middle of the 19th century.

2. This species, of which the collections are conspicuously monoecious, combines characters of both *Z. mucronata* and *Z. repanda*, the numerous herbarium specimens of which are usually of one sex only. Possibly *Z. perpusilla* is of hybrid origin, but because its original habitat may have been destroyed, much-desired further study on recent collections seems unlikely.

3. Zehneria repanda (Blume) C. Simmons, *comb. nov.* — Fig. 2

Bryonia repanda Blume, Bijdr. Fl. Ned. Ind. 15 (1826) 923; Ser. in DC., Prodr. 3 (1828) 305. — *Melothria punctata* auct. non (Thunb.) Cogn.: Cogn. in A. & C. DC., Monogr. Phan. 3 (1881) 615, p.p.; in Engl., Pflanzenr. IV.275.I (1916) 117, p.p., for the syn. *Bryonia repanda* Blume only. — *Zehneria scabra* auct. non (L.f.) Sond.: C. Jeffrey, Kew Bull. 15 (1962) 369, p.p., for the syn. *Bryonia repanda* Blume only. — Lectotype (designated here): *Blume s.n.* ("crescit: in sylvis altioribus montis Burangrang"), Herb. Lugd.-Bat. 901.288-300, Java (L).

Zehneria exasperata Miq., Fl. Ind. Bat. 1, 1 (1855) 655. — Lectotype (designated here): *Horsfield s.n.* (U), Java.

Melothria cordata auct. non (Thunb.) Cogn.: Backer in Backer & Bakh.f., Fl. Java 1 (1963) 297, p.p.

Zehneria maysorensis auct. non (Wight & Arn.) Arn.: C. Jeffrey, Kew Bull. 15 (1961) 371, p.p., for the Sumatra record only.

Dioecious (always?). *Leaf* blades entire, ovate to ovate-oblong, or ± 5-angular, scabrous with whitish cystoliths above, on lower surface, especially on the veins, sparsely to densely bristly hairy, sometimes subglabrous; margin coarsely dentate. *Tendrils* soft-pubescent or glabrous. *Male perianth* at anthesis 4–6 (–8) mm diam.; hypanthium-tube 2–3 mm wide. *Petals* adaxially glabrous or papillose-hairy, hypanthium-tube glabrous inside or pilose at the throat, rarely almost completely pilose. *Anthers* circular in outline, filaments glabrous or pilose only at the middle. Staminodes of female flowers (largely) glabrous. *Ovary* (sub)globose. Neck between ovary and perianth conspicuous, at least half as long as the ovary. *Fruits* globose, 5–8 mm diam., indistinctly pitted (lens!), purplish black, somewhat glaucous. *Seeds* 3.5–4 mm long, slightly margined or without margin.

Distribution — Whole of Java, Bali.

Habitat & Ecology — In the mountains; 1400–2500 m altitude.

Note — Some collections from the Idjen Plateau, E Java (*Clason-Laarman E 73*, male; *Kleinhoonte 231*, male; *Koorders 37374*, fr., *43255*, fr., *43643*, female) are deviating but are treated under *Z. repanda* because of the coarse indumentum of the leaves. They are apparently intermediate with *Z. mucronata*, testified by the strongly hairy inside of the perianth (Fig. 2), the absence of a neck between ovary and perianth, the slightly elongated fruits and the seeds (partly) ± margined. Typical *Z. repanda* is known from the same area. All collections are rather old, and a study of more recent material is needed to establish the status of this material.

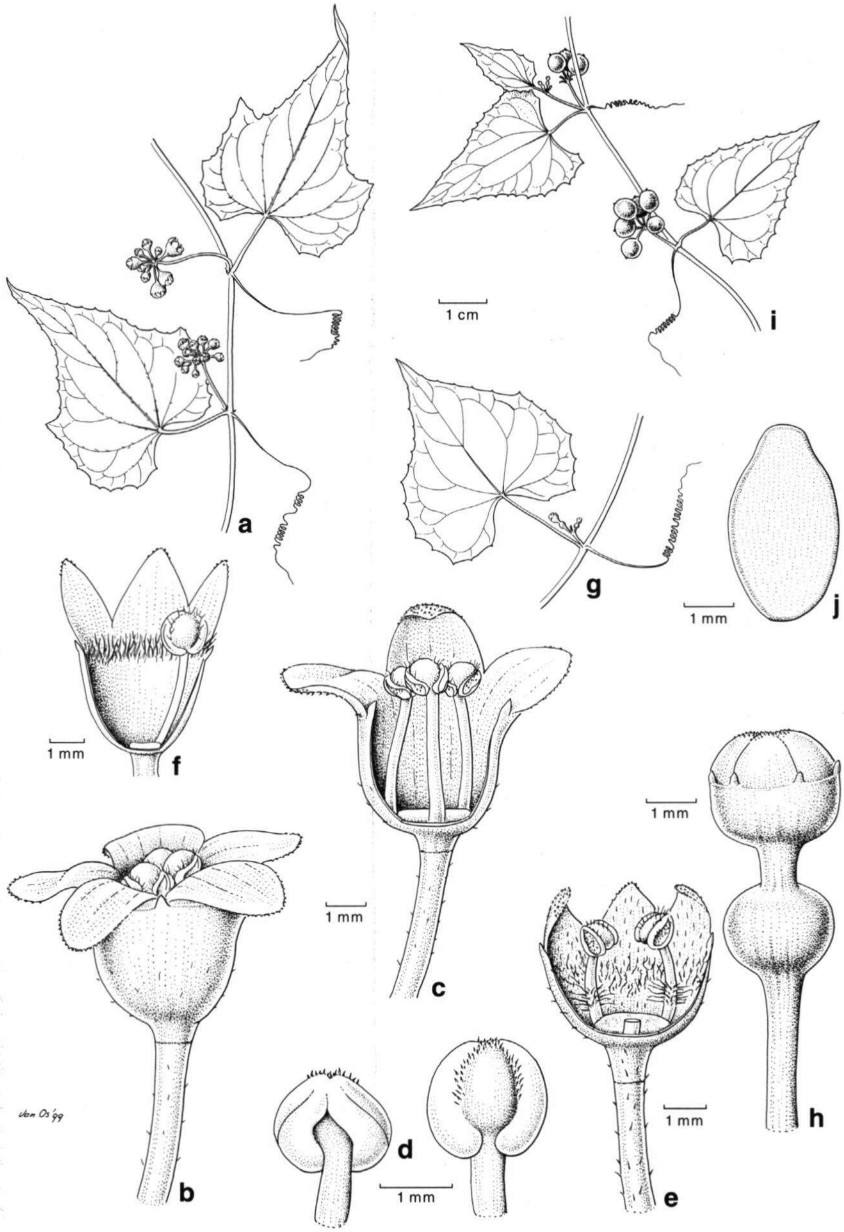


Fig. 2. *Zehneria repanda* (Blume) C. Simmons. a. Portion of shoot with male inflorescences; b. male flower; c. ditto, perianth partly removed to show stamens and disc; d. anthers, about as long as wide; e & f. opened male flowers of different specimens, somewhat schematic; g. node with female inflorescence; h. nearly mature female bud; i. portion of twig with infructescences; j. seed with faint margin [a–d: *Kleinhoonte 388*, L; e: *Kleinhoonte 231*, L; f: *Anon.*, Herb. *J.J. Smith 134*, L; g & h: *De Wilde & De Wilde-Duyfjes 21764*, L; i & j: *Korthals* (Herb. Lugd.-Bat. 901.288-286)].

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IDENTIFICATION LIST

The numbers after the collectors and their collecting numbers refer to:
1 = *Zehneria mucronata*; 2 = *Z. perpusilla*; 3 = *Z. repanda*

Afriastini 574: 1 — Anonymous (herb. J.J. Smith) 134: 3; 299: 3 — Arens 77: 3.
Backer 3491: 1; 36583: 3; 36679: 1; 36801: 1 — Bakhuizen van den Brink 436: 1; 2009: 1; 3832: 1; 4115: 3; 4553: 3; 7609: 1; 7614: 1 — Barkmeyer 95: 1 — Bloembergen 452: 3 — Blume s.n. (with herb. Reinwardt. s.n., herb. Kuhl & van Hasselt s.n.) (syntype): 1; s.n. (several different collections, syntype material): 2; s.n. (several different collections, syntype material): 3 — Boerlage 153: 1; s.n., 06-11-1888: 1; s.n., 13-11-1888: 1; s.n., 17-12-1888: 1; s.n., 14-06-1898: 3 — Bubung Sk 297: 1 — Buysman 254: 1.
Clason-Laarman E 73: 3 (deviating) — Coert 292: 3.

Danser 5973: 3; 6288: 1 — De Voogd 720: 3 — De Vries s.n., 05-05-1926: 1 — De Wilde & De Wilde-Duyfjes 21657: 3; 21682: 1; 21708 (Bali): 3; 21727 (Bali): 1; 21728 (Bali): 1; 21764: 3; 21765: 3; 21779: 1; 21816: 1; 21893: 1 — Docters van Leeuwen-Reynvaan s.n., ?-01-1909: 1; 2373: 3; 2374: 3 — Dorgelo S342: 3; S463: 3 — Durand in Van Harreveld HT8562: 3.

Endang & Wiriadinata 15: 1 — Excursion Burangrang 3027: 3.

Grutterink 3039: 1.

Hallier 119b: 1; 384: 3 — Holstvoogd 450: 3.

Jacobs 4983: 1 — Junghuhn 133: 3.

Karsten 33: 3 — Kern 8495: 1; 8644: 1 — Kleinhoonte 118: 3; 231: 3 (deviating); 388: 3 — Koorders 22763: 1; 23117: 1; 23193: 1; 26045: 3; 29194: 1; 29197: 1; 29982: 1; 30240: 1; 37374: 3; 43255: 3; 43256 (a deviating, hairy specimen, which links up with deviating specimens as remarked under *Z. repanda*): 1; 43476: 3; 43643: 3; 43816: 3 — Korthals s.n. (Mt Papandayan, female): 2; L 901.288-286: 3; L 901.288-289: 3.

Lam 118: 3.

Meijer 59: 3 — Mogea 2534: 1 — Murata 1349: 1.

Nedi & Idjan 231: 1.

Popta 181: 1 — Pulle 3095: 3; 4047: 3.

Raap 650: 3.

Soewarta 4: 3.

Van Steenis 5264: 1.

Waitz 68: 1; s.n. (L 901.288-301): 3 — Wickel 1246: 1 — Wirawan 482 (Bali): 1.

Zollinger 1127 (Bali): 1.